$a_n = a_1 + (n-1)d$ $\qquad a_n = a_1 \cdot r^{(n-1)}$

$S_n = \frac{n}{2}(a_1 + a_n)$ $\qquad S_n = a_1\left(\frac{1-r^n}{1-r}\right)$ $\qquad \sum_{n=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$

Algebra 2/Trig 1

Sequence and Series #4

Name Key

Block ______ Date ______

Determine the rule (formula) for the given sequences.

1. 4, 7, 10, 13, 16, 19, 22, ...

$a_n = 4 + (n-1) \cdot 3$

2. 6, 12, 24, 48, 96, ...

$a_n = 6 \cdot (2)^{n-1}$

3. 100, $\frac{100}{3}, \frac{100}{9}, \frac{100}{27}, \frac{100}{81}$

$a_n = 100 \cdot \left(\frac{1}{3}\right)^{n-1}$

4. 1, 4, 9, 16, 25, 36, 49, 64, 81, ...

$a_n = n^2$

Determine the rule (formula) for the given sequence then determine the desired terms.

5. 6, 8, 10, 12, 14, 16, 18, 20, ...

Find a_{15} and a_{34}

$a_n = 6 + (n-1) \cdot 2$

$a_{15} = 6 + (15-1) \cdot 2$

$6 + 14 \cdot 2$

$6 + 28$

$a_{15} = 34$

$a_{34} = 6 + (34-1) \cdot 2$

$a_{34} = 72$

6. 5, 25, 125, 625, 3125, 15625, ...

Find a_2 and a_{11}

$a_n = 5 \cdot 5^{n-1}$

$a_2 = 25$

$a_{11} = 5 \cdot 5^{11-1}$

$a_{11} = 48828125$

Determine the desired terms of the following sequences.

7. $a_n = 4 + (n-1) \cdot 5$

$a_1 = 4$

$a_{10} = 4 + (10-1) \cdot 5 = 49$

$a_{256} = 4 + (256-1) \cdot 5 = 1279$

8. $a_n = n(n+1)$

$a_1 = 1(1+1) = 2$

$a_2 = 2(2+1) = 6$

$a_3 = 3(3+1) = 12$

$a_{20} = 20(20+1) = 420$

$a_{56} = 56(56+1) = 3192$

9. $a_n = 384 \cdot \left(\frac{1}{2}\right)^{(n-1)}$

$a_1 = 384$

$a_2 = 192$

$a_3 = 96$

$a_8 = 384 \cdot \left(\frac{1}{2}\right)^{(8-1)} = 3$

$a_{13} = 384 \cdot \left(\frac{1}{2}\right)^{(13-1)} = \frac{3}{32}$

$= .09375$

$a_n = a_1 + (n-1)d$ $\qquad a_n = a_1 \cdot r^{(n-1)}$

$S_n = \frac{n}{2}(a_1 + a_n)$ $\qquad S_n = a_1\left(\frac{1-r^n}{1-r}\right)$ $\qquad \sum_{n=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$

Determine the rule(formula) for the following series. Write using sigma notation then determine the sum of the following series:

10. 4 + 20 + 100 + 500 + 2500 + 12500 + 62500

$\cancel{a_n = 4+(n-1)\cdot 5}$ $\qquad a_n = 4\cdot 5^{(n-1)}$

$\cancel{\sum_{n=1}^{7} 4+(n-1)\cdot 5}$ $\qquad \sum_{n=1}^{7} 4\cdot 5^{(n-1)}$

$\cancel{S_n = \frac{7}{2}(4+62500)}$

$\cancel{S_7 = 218764}$ $\qquad S_7 = 4\left(\frac{1-5^7}{1-5}\right) = 78124$

11. 5 + 8 + 11 + 14 + 17 + 20 + 23 + 26 + 29

$a_n = 5+(n-1)\cdot 3$

$\sum_{n=1}^{9} 5+(n-1)\cdot 3$

$S_9 = \frac{9}{2}(5+29)$

$S_9 = 153$

Write the following sequences in sigma notation then determine the sum of the following series.

12. $a_n = 92 + (n-1)\cdot -3$ $\quad S_{13}$

$\sum_{n=1}^{13} 92+(n-1)\cdot(-3)$

$a_1 = 92$

$a_{13} = 92+(13-1)\cdot(3) = 56$

$S_{13} = \frac{13}{2}(92+56)$

$S_{13} = 962$

13. $a_n = 3\cdot 4^{(n-1)}$ $\quad S_9$

$\sum_{n=1}^{9} 3\cdot 4^{(n-1)}$

$a_1 = 3$

$S_9 = 3\left(\frac{1-4^9}{1-4}\right)$

$S_9 = 262143$

14. $a_n = (n-1)\cdot 6$ $\quad S_{42}$

$\sum_{n=1}^{42} (n-1)\cdot 6$

$a_1 = 0$

$a_{42} = 246$

$S_{42} = \frac{42}{2}(0+246)$

$S_{42} = 5166$

15. $a_n = 7\cdot 2^{(n-1)}$ $\quad S_7$

$\sum_{n=1}^{7} 7\cdot 2^{(n-1)}$

$a_1 = 7$

$S_7 = 7\left(\frac{1-2^7}{1-2}\right) = 889$

$a_n = a_1 + (n-1)d$ $\qquad a_n = a_1 \cdot r^{(n-1)}$

$S_n = \frac{n}{2}(a_1 + a_n)$ $\qquad S_n = a_1\left(\frac{1-r^n}{1-r}\right)$ $\qquad \sum_{n=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$

Find the sum given the following sigma notation.

16. $\sum_{n=1}^{9} 4n$

$4+8+12+16+20+24+28+32+36$

180

OR

$a_1=4$

$a_9=36$

$S_9 = \frac{9}{2}(4+36)$

$S_9 = 180$

17. $\sum_{n=1}^{90} 4n$

$a_1 = 4$

$a_{90} = 360$

$S_{90} = \frac{90}{2}(4+360)$

$S_{90} = 16380$

18. $\sum_{n=1}^{7} n^2$

$1+4+9+16+25+36+49$

140

OR

$S_7 = \frac{7(7+1)(2\cdot 7+1)}{6} = 140$

19. $\sum_{n=1}^{7} 3\cdot(6)^{(n-1)}$

$3+18+108+648+3888+23328$
$+139968$

167961

OR

$S_7 = 3\left(\frac{1-6^7}{1-6}\right) = 167961$

20. $\sum_{n=1}^{128} 8+(n-1)\cdot 3$

$a_1 = 8$

$a_{128} = 389$

$S_{128} = \frac{128}{2}(8+389)$

$S_{128} = 25408$

21. $\sum_{n=1}^{20} n^2$

$a_1 = 1$

$a_{20} = 400$

$S_{20} = \frac{20(20+1)(2\cdot 20+1)}{6}$

$S_{20} = 2870$

$a_n = a_1 + (n-1)d$ $\quad a_n = a_1 \cdot r^{(n-1)}$

$S_n = \frac{n}{2}(a_1 + a_n)$ $\quad S_n = a_1\left(\frac{1-r^n}{1-r}\right)$ $\quad \sum_{n=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$

22. The first row of a concert hall has 25 seats and each row after the first has one more seat than the row before it. There are 32 rows of seats. How many total seats are there?

$a_1 = 25$

$a_2 = 26$

$a_3 = 27$

$a_n = 25 + (n-1)\cdot 1$

$a_{32} = 25 + (32-1)\cdot 1$
$= 25 + 31$
$= 56$

$S_n = \frac{n}{2}(a_1 + a_n)$

$S_{32} = \frac{32}{2}(25+56)$

$= 16(81)$

$= 1296$

23. You have started a savings account and placed \$1500 into the account with a 3% interest rate. How much money would be in your account after 8 years?

$a_n = 1500 \cdot 1.03^{n-1}$

$a_8 = 1500 \cdot 1.03^{(8-1)}$

$a_8 = 1844.81$

24. Rolls of toilet paper are on sale at the grocery store and are being displayed at the end of the aisle. There are 16 rolls on the bottom row, 15 on the row above, 14 on the row above that and so on. How many total rolls of toilet paper are on display?

$a_1 = 16$

$a_2 = 15$

$a_3 = 14$

$\vdots$

$a_n = 16 + (n-1)\cdot(-1)$

$a_{16} = 16 + (16-1)\cdot(-1) = 16 + 15(-1) = 1$

$S_n = \frac{n}{2}(a_1 + a_n)$

$S_{16} = \frac{16}{2}(16+1)$

$S_{16} = 8(17)$

$S_{16} = 136$